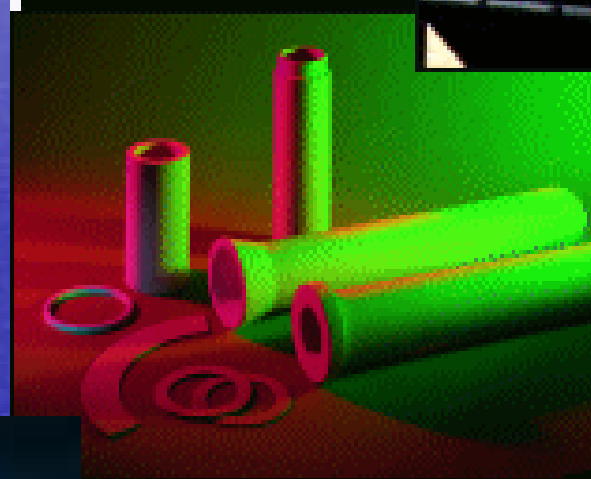
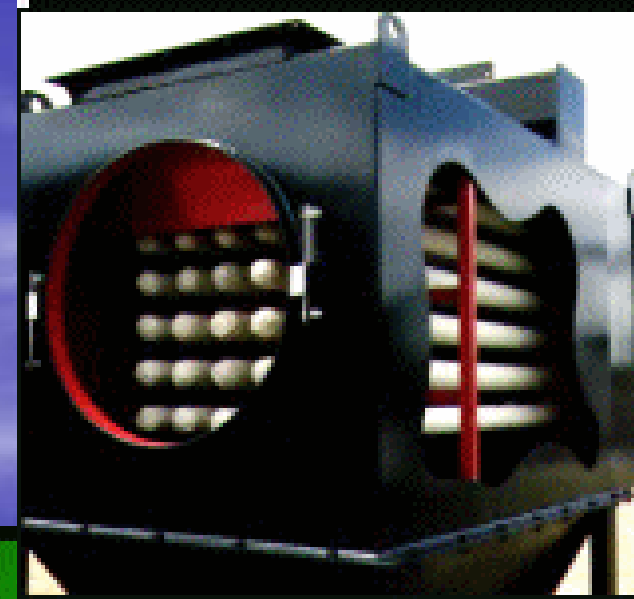
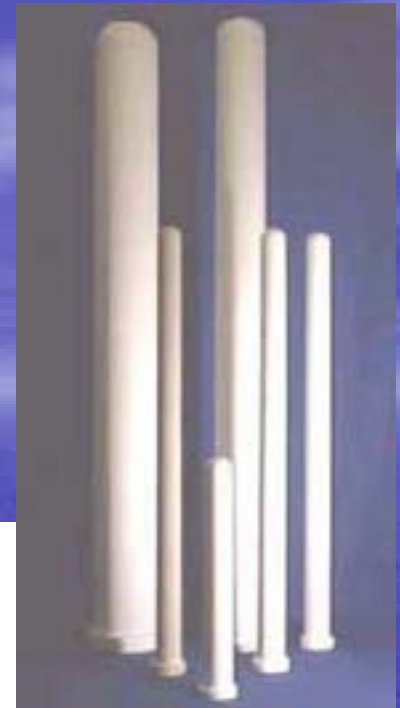


Qualifications of Candle Filters for PFBC Applications



Southern Illinois University
Siemens Westinghouse
Power Corporation

High Temperature Particulate Filtration



FILTER

Hot Dirty Gas



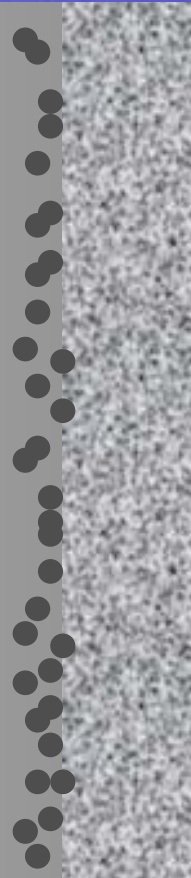
Particulate

Sulfur

Alkali

CO

HCL



Ash Cake

**Hot Clean
Gas**



Meets NSPS

Protect Downstream Equipment

Efficient Energy Recovery

Reduced Maintenance

Process Versatility

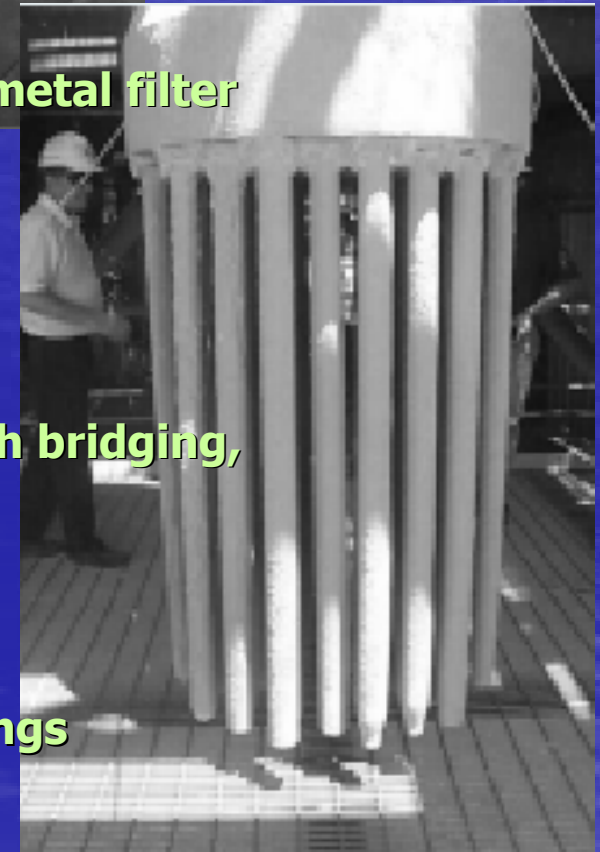
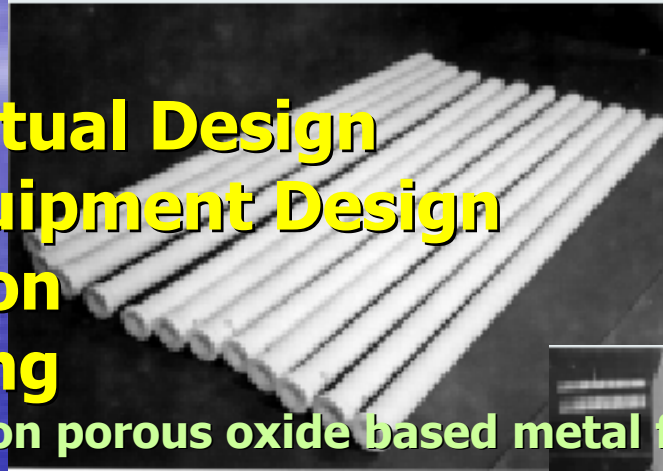
OBJECTIVES

- Identify and Demonstrate the Stability of Porous Candle Filters (~1600 F)
- Demonstrate applications in PFBC process
- Define the overall Reliability and Durability
 - Thermal
 - Mechanical
 - Chemical
- Define the Life of Filters



TASKS

- **Filter System Conceptual Design**
- **Filter Facility and Equipment Design**
- **Equipment Installation**
- **AFBC Filtration Testing**
 - Advanced 2nd generation porous oxide based metal filter
 - 12 1.5 m candle filters
 - Slip stream from flue gas
 - 1500-1600 F
- **Filter Performance**
 - PM removal performance
 - Visual inspection for cracks, chips, bowing, ash bridging, agglomeration
- **Material Assessment**
 - Gas flow resistance
 - Microstructural Analysis
 - Compressive and tensile strength analysis of rings
 - XRD

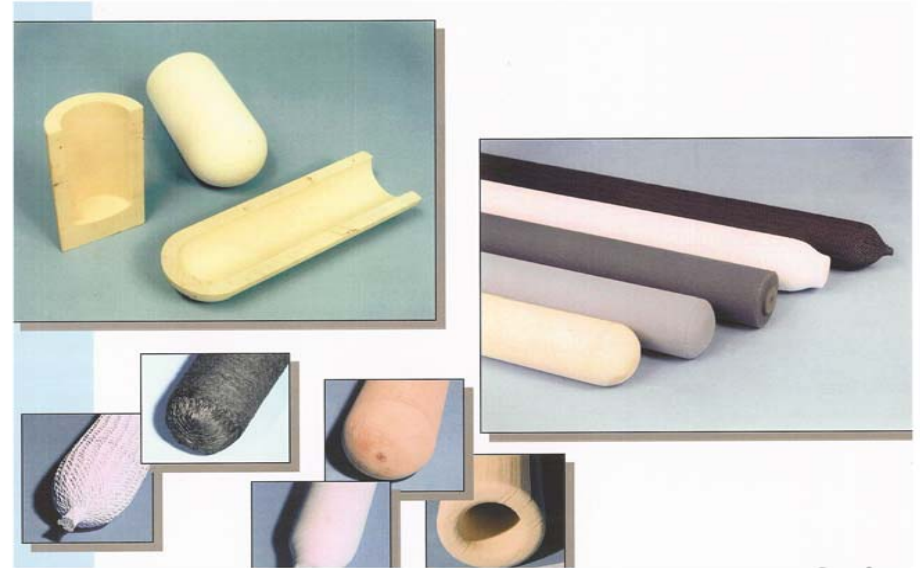
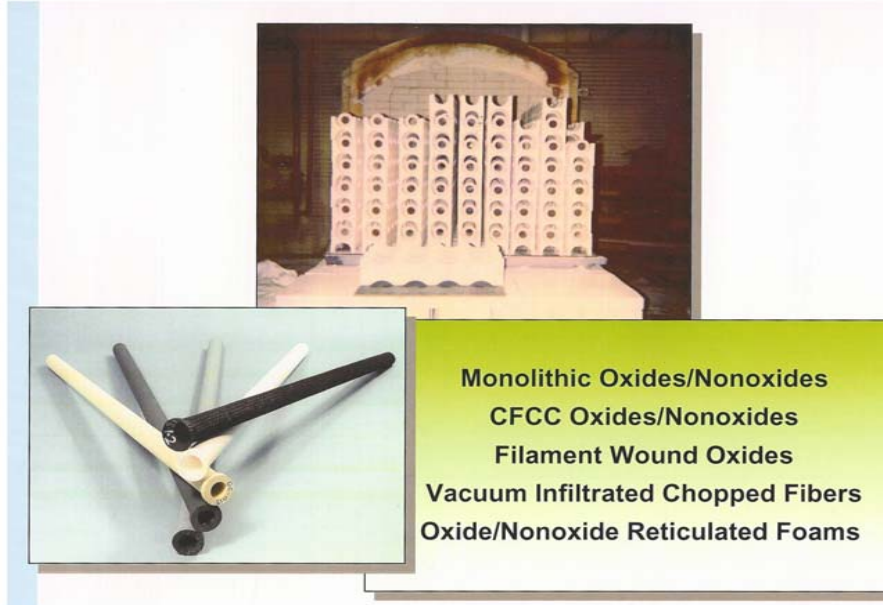


Siemens Westinghouse Power Corporation

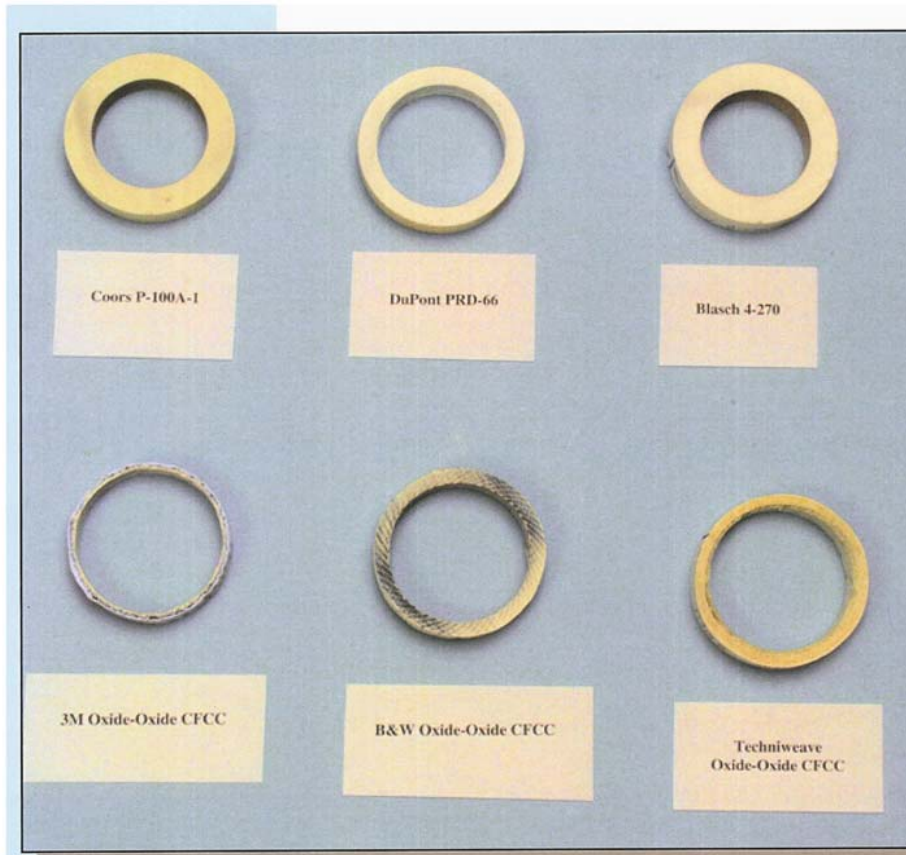
- Design of Filter Systems
 - Vessels
 - Elements
 - Internals
 - Pulse Cleaning Skids



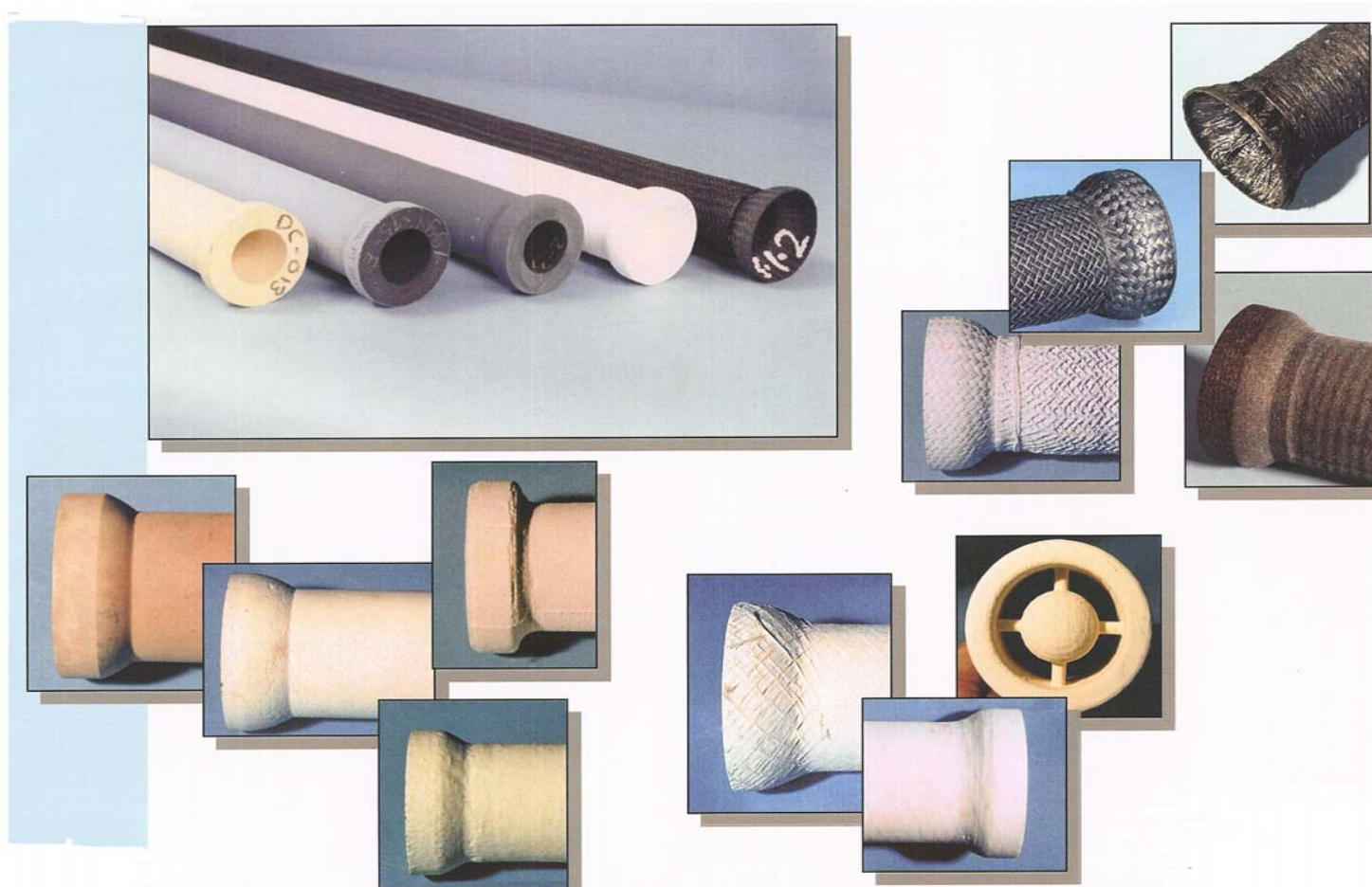
CERAMIC FILTER DEVELOPMENT



Ceramic Filter Development



Ceramic Filter Development



Southern Illinois University

- **Design and Modification of AFBC**

- Inlet Hot Gas Ducting
- Inlet Ash Removal
- Outlet Gas Ducting
- Filter Vessel
- Solids Handling and Disposition

- **Testing of Candle Filters**

- Outlet Gas Quality
- Visual Inspection of Filter
- Filter Life

- **Material Assessment**

- Gas Flow Resistance
- Compressive and Tensile Strength
- Microstructural Changes
- XRD Analysis

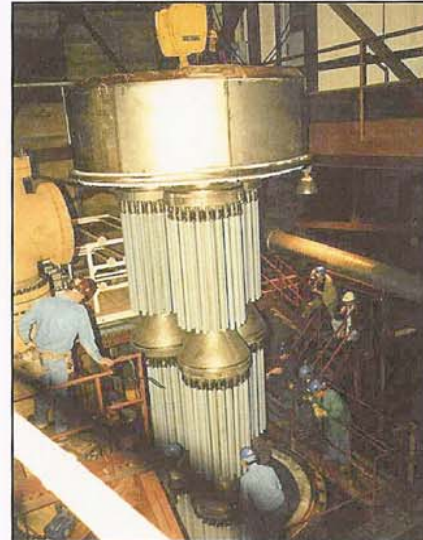
SIU AFBC system



Past Filter Performance Demonstration

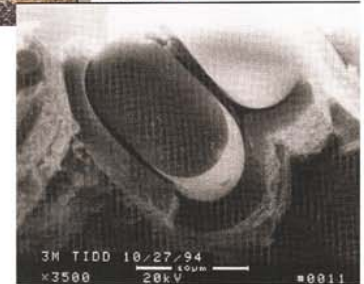
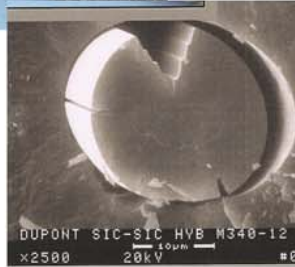


IGCC



PFBC

2nd Generation Oxide Based Filter Failure Mechanism



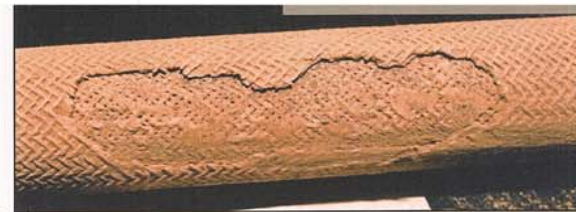
High Temperature Oxidation

Fiber Embrittlement

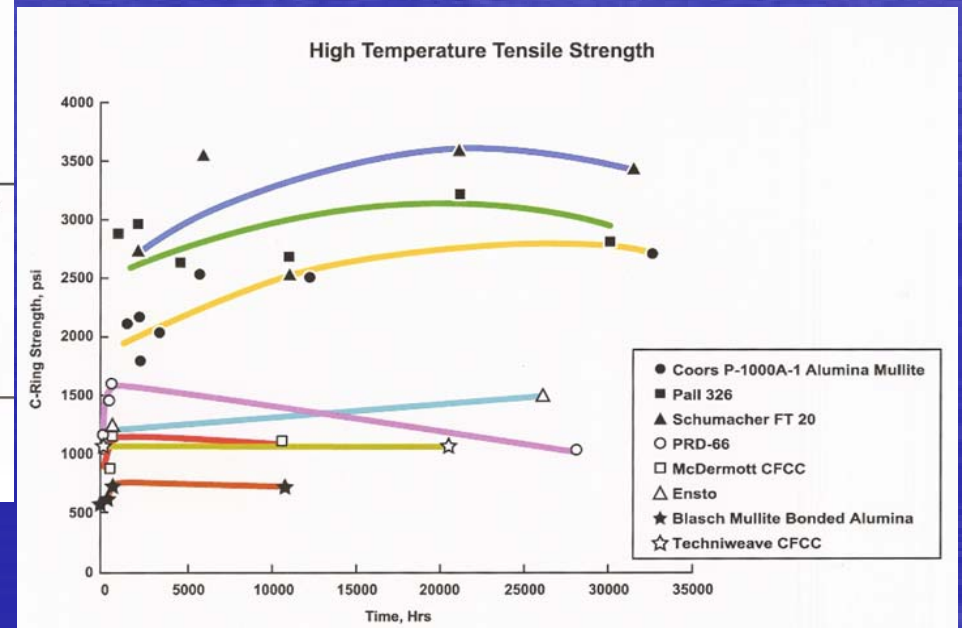
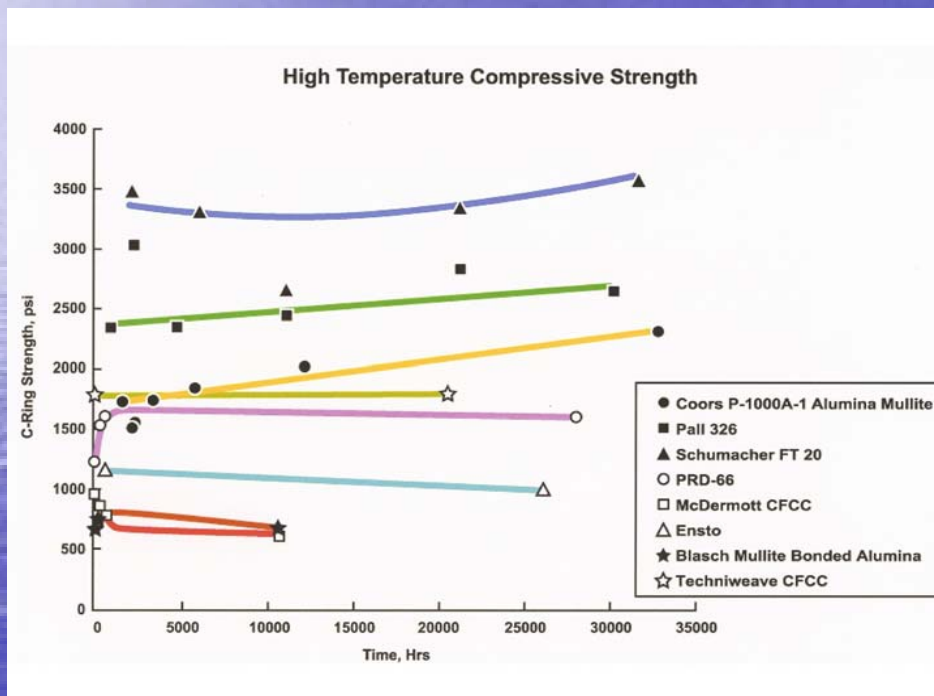
**Fracture Toughness Reduced Due to
Brittle Fracture Characteristics**

Seam Debonding

Low Load Bearing Characteristics



Residual Ceramic Filter Matrix Strength (SWPC)



Anticipated Results

- Long term Operation at 1600 F
- >99.999 % removal of PM
- 10 ft/min gas flow at 1 atm pressure
- >8000 hrs of service life
- Demonstrate performance in ash-containing environment
- Demonstrate performance in the presence of volatile species

ANTICIPATED BENEFITS

- Continuous Long Term Filter Exposure Data applicable to PFBC
- Experimental Evidence of the merits of the new generation of durable filters for PFBC systems
- Promote further demonstration of the technology

Project Schedule

